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(पहला पुनरीक्षण)

**Recommendations for Storage and
Handling of Pneumatic Tyres for
Automotive Vehicles**
(*First Revision*)

ICS 83.160.01

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FOREWORD

This Indian Standard (First Revision) was adopted by the Bureau of Indian Standards, after the draft finalized by the Automotive Tyres, Tubes and Rims Sectional Committee had been approved by the Transport Engineering Division Council.

This standard was first published in 1985. This first revision incorporates the experience gained with the use of this standard and brings the standard in line with the latest development in the field. Following major modification have been incorporated in this revision:

- a) Provision for radial tyre is introduced;
- b) New tyre size designation are added; and
- c) Provision for contact with water is modified.

This standard is one of the standards formulated on the recommendations for storage and handling of tyres, inner tubes, flaps, rims, etc, the other standard in this series being IS 11031 : 2023. Recommendations for storage and handling of inner tubes, flaps and tube valves for use with pneumatic tyres for automotive vehicles.

This standard has been prepared to help the manufacturers, organized consumers and tyre dealers for storage of tyres.

It is well known that rubber products deteriorate when exposed to sunlight, air currents, dirt, moisture, heat, etc. Therefore, these recommendations outline the methods to prevent tyres with their contact. Electrical discharges in the vicinity of tyres have to be avoided as they generate ozone which greatly accelerates oxidation and deterioration of rubber products. High ambient temperatures also accelerate deterioration of rubber products. Sub-zero temperatures cause rubber products to become stiffer causing embrittlement and, therefore, for operation and storage at such low temperatures, tyre manufacturers should be consulted. Air currents increase oxygen supply in the warehouses thereby causing oxidation of tyres, therefore, draughts should be avoided. Excessive moisture in the tyre carcass increases growth of moulds in service and reduces its service life and should, therefore be avoided.

The deleterious effects of the above factors can be minimized by a careful choice of storage conditions. A tyre may prematurely fail in service because of poor storage conditions. This can be avoided by following the recommendations outlined in this standard.

These recommendations also outline the methods of stacking of tyres and precautions to be followed for making the stacks.

The composition of the Committee responsible for formulation of this standard is given in Annex A.

For the purpose of deciding whether a particular requirement of this standard is complied with, the final value, observed or calculated, expressing the result of a test or analysis, shall be rounded off in accordance with IS 2 : 2022 'Rules for rounding off numerical values (*second revision*)'. The number of significant places retained in the rounded off value should be the same as that of the specified value in this standard.

*Indian Standard***RECOMMENDATIONS FOR STORAGE AND HANDLING OF
PNEUMATIC TYRES FOR AUTOMOTIVE VEHICLES***(First Revision)***1 SCOPE**

1.1 This standard prescribes recommendations for storage and handling of pneumatic tyres for use on automotive vehicles including earthmoving machinery, off-the-road vehicles, industrial trucks and tractors, agricultural tractors and trailers.

1.2 This standard is not applicable to tyres for bicycles and rickshaws.

2 REFERENCES

This standard does not contain any reference.

3 STORAGE

All tyres shall be stored inside a warehouse. The precautions and procedures given in **3.1** to **3.7** and **4** shall be followed.

3.1 The tyres shall be stored in a covered place (warehouse) to prevent exposure to light from skylights, windows, doors or other openings. Skylight glass shall be painted all over with dark paint. Any openings shall be kept closed so that light entering the warehouse is reduced to the minimum possible. Electric lights shall not be left 'ON' beyond the time necessary (*see* Fig.1).

3.2 In case the warehouse, where tyres are stored, can not be darkened for some reason, the storage piles of tyres shall be carefully covered with tarpaulin or some reasonably heavy woven fabric for complete protection against light, air current, dirt, water, etc (*see* Fig. 1).

3.3 The tyres shall not be stored in a room where electrical discharges occur, or are likely to occur, as a result of the operation of electric motors, arc welding, generators, switches or other electrical devices (*see* Fig. 1).

3.4 Storage arrangements shall be so planned that stocks are rotated to move the oldest tyres first and any accumulation of very old stocks shall be avoided

by issuing the stock on the principle of first-in-first-out (FIFO).

3.5 Tyres shall not be piled near radiators, or other sources of heat or air coolers. The temperature in the warehouse shall be kept as low as possible. Storage at sub-zero temperatures shall be avoided. However, where it is necessary to do so, tyre manufacturer may be consulted for storage, handling and use.

3.6 Air draughts shall be avoided in the warehouse to stem deterioration of tyres due to continued supply of oxygen in the air currents.

3.7 Excessive humid atmosphere shall be avoided in the storage space. High humidity causes moisture to condense inside the tyre carcass resulting in more tyre growth in service than desirable. This affects the service, life and performance of tyres.

4 STACKING AND HANDLING

4.1 Tyres shall be stacked in as stress free conditions as possible. Depending on the space available any of the methods outlined in **4.1.1** or **4.1.2** shall be adopted.

4.1.1 When there is sufficient space available it is recommended that the tyres be stored vertically side by side in racks made from rust proof tubular piping. Depending on the convenience of handling tyres and, ceiling height, the number of such racks may be increased vertically, ensuring that there is no direct heat dissipation from the ceiling roof to the tyres stored on the top rack. The tyres shall be so stored that their weight is supported by the tread at two points over the piping. The supports shall be so arranged that approximately three quarter of the tyre circumference is above the supports and one quarter below them.

4.1.1.1 All types of radial ply tyres and tyres for earthmoving equipment shall be stacked vertically on hammock type racks so that the weight of the tyre or tyres is supported by the tread, approximately one-third the tyre circumference fully in contact with the hammock.

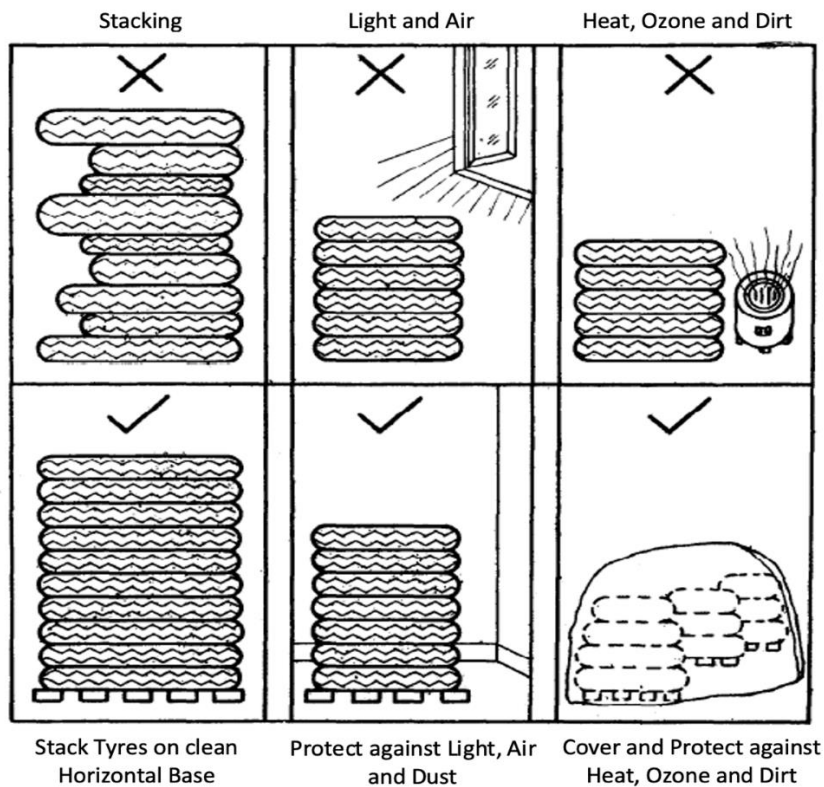


FIG. 1 TYPICAL ILLUSTRATION SHOWING CORRECT (✓) AND WRONG (X) STORAGE

4.1.2 Where there is limitation of space, tyres may be piled horizontally one above the other, over a clean, level, cemented floor. It is accepted that such storing will result in some deformation of tyres. In order that the deformation is kept within the acceptable limits the height of the piles shall not exceed the values recommended below.

4.1.2.1 Moped and motorcycle tyres

Stack may be made of a maximum of 25 tyres. Binder tyres up to a maximum of 5 tyres above the top tyre may be stacked as shown in Fig. 2.

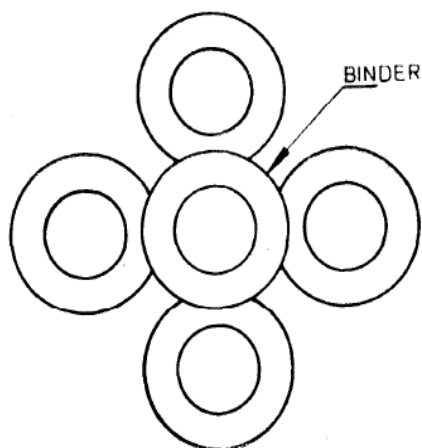


FIG. 2 PLAN FOR PILLING TYRES

(To provide stability tyres are to be stacked in four piles as shown)

4.1.2.2 Car, scooter, and scooter derivative tyres (diagonal ply and radial tyres)

Stack may be made of a maximum of 20 tyres. Binder tyres up to a maximum of 5 tyres above the top tyre may be stacked as shown in Fig. 2.

4.1.2.3 Truck and bus Tyres (Diagonal ply and Radial tyres)

Stack may be made of tyres so that the total height does not exceed 1.8 m. On top of the stack a maximum of 2 binder tyres may be stacked. For some of the sizes of tyres the number of tyres that can be stacked works out as follows:

Sl No.	Tyre Size Designation	No. of Tyres in a Stack
(1)	(2)	(3)
i)	9.00 - 20	9 plus 2 binder tyres on top of ninth tyre
ii)	9.00R20	
iii)	10.00 - 20,	8 plus 2 binder tyres on top of eighth tyre
iv)	10.00R20	
v)	11.00 - 20,	
vi)	11.00R20,	
vii)	11R22.5 TL,	
viii)	12.00R20,	
ix)	295/80R22.5 TL	

4.1.2.4 Light truck tyres

Stack shall be made of maximum of 15 tyres.

4.1.2.5 Tractor tyres

a) Rear stack shall be made of tyres as follows:

Tyre Size Designation	No. of Tyres in a Stack, Max
8.3 and 11.2 section	15
12.4 to 13.6 section	12
16.9 section and over	7

NOTE — The circumferential alignment of the tyres in a stack shall be such that the tread bars of one tyre are adjacent to those of the tyre below it.

b) Front stack shall be made of a maximum of 10 tyres.

4.1.2.6 Animal drawn vehicle tyres

Stack shall be made of a maximum of 10 tyres.

4.1.2.7 Earth moving equipment tyres

Tyres of this type shall not be stacked horizontally.

4.1.2.8 To provide stability to the stacks the tyres shall be stacked in four piles as shown in Fig. 2.

4.1.2.9 As far as possible mixing of sizes in a stack shall be avoided. Large section or large diameter tyres shall not be stacked above the smaller sizes in a stack (see Fig. 1).

4.1.2.10 Where it is required to utilize more vertical space than permitted by 4.1.2, pallet type crates may be used in combination with fork-lift trucks. The pallets shall be of sufficient strength to withstand handling and shall be able to support the load of tyres on it without damage to tyres.

4.1.2.11 All the tyres in a stack shall be turned and repiled at least every 90 days. If possible, this operation may be performed earlier than the 90 days period. In this operation the bottom most tyres shall be placed at the top and the top most tyre at the bottom.

4.2 Stacking of tyres on dirty floors shall be avoided. If the tyres are to be stacked on floor a foundation of clean wooden strips of about 13 mm thickness shall be laid on the floor to avoid contact with dirt, oils, grease, solvents, floor polish, etc (see Fig. 1).

4.3 Lacing of tyres in piles shall be avoided. Lacing may cause kinks in beads and may distort the form of tyres.

5 OUTSIDE STORAGE OF TYRES

5.1 Outside storage of tyres is not recommended. It is recognised that this may be necessary in extreme emergency conditions but such storage shall not exceed 30 days. In case tyres are stored outside, at the earliest opportunity the tyres shall be shifted to a warehouse and procedures and precautions given in 3 and 4 shall be followed.

5.2 In case of outside storage, a suitable foundation shall be constructed so that tyres do not come in contact with the ground. The tyres shall be piled according to the procedure outlined in 4.1. The piles shall be covered by tarpaulin or similar material ensuring protection against sunlight, water and other contaminants (see Fig. 1).

5.3 It shall be ensured that no water is present in the carcass before the tyres are stacked. Tube and flap shall be removed to check the presence of water. Any water shall be completely removed and the tyres shall be dried at room temperature before stacking.

ANNEX A
(Foreword)

COMMITTEE COMPOSITION

Automotive Tyres, Tubes and Rims Sectional Committee, TED 07

<i>Organization</i>	<i>Representative(s)</i>
In personal Capacity (302, Celestina Apts. S. N 1841, Rambhu Kambale Path Shivajinagar, Pune)	SHRI D. P. SASTE (Chairperson)
All India Motor Transport Congress, New Delhi	SHRI CHARAN SINGH SHRI M. MURLI (<i>Alternate</i>)
Ashok Leyland Limited, Chennai	SHRI V. P. GAUTAM SHRI MUTHU KUMAR N. (<i>Alternate</i>)
Association of State Road Transport Undertaking, New Delhi	SHRI R. CHANDRABABU SHRI ULLAS BABU (<i>Alternate</i>)
Automotive Components Manufacturers Association, (ACMA)	SHRI UDAY HARITE MS. SEEMA BABAL (<i>Alternate</i>)
Automotive Research Association of India, Pune	SHRI A. AKBAR BADUSHA SHRI V. S. KHARIRATKAR (<i>Alternate I</i>)
Automotive Tyre Manufacturers Association, New Delhi	SHRI RAJIV BUDHIRAJA SHRI T. C. KAMATH (<i>Alternate</i>)
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Indian Rubber Manufacturers Research Association, Thane	DR. K. RAJ KUMAR
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International Centre of Automotive Technology, Manesar	SHRI AMIT KUMAR KARWAL SHRI VIJAYANTA AHUJA (<i>Alternate</i>)
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Mahindra & Mahindra Limited, Mumbai	SHRI RAM SINGH SHRI VISHWANATHAN T. (<i>Alternate</i>)

<i>Organization</i>	<i>Representative(s)</i>
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Minda Kosei Aluminum Wheels Private Limited, Bawal	SHRI HEMANT PARKHI SHRI NARAYAN GIRI (<i>Alternate</i>)
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Member Secretary

MR AUGUST DUBEY
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Amendments Issued Since Publication

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